Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Electric Field-Induced Effects on Single-Walled Carbon Nanotube Photoluminescence ANTON NAUMOV, SERGEI BACHILO, R. BRUCE WEISMAN, Rice University, Houston, TX — An investigation of the fluorescence emission of single-walled carbon nanotubes (SWNTs) in electric fields will be described. HiPco SWNTs were embedded in poly(methylmethacrylate) (PMMA) films deposited onto the surface of microscope slides with ITO or interdigitized gold electrodes. The fluorescence of individual semiconducting SWNTs was then observed using a microscope coupled to a near-IR spectrograph and an InGaAs 2-D camera. Bulk samples of SWNTs in polymer were studied with a spectrofluorometer. When SWNTs in PMMA were subjected to electric fields of up to 10^7 V/m, a drastic decrease in fluorescence intensity was observed. This quenching is well described as a single-parameter inverse hyperbolic cosine function of applied field. The quenching effect is also dependent on the angle between SWNT and field, the length of the SWNT, and SWNT diameter (exciton binding energy). The quenching mechanism may involve both exciton dissociation in an electric field and free carrier effects. The latter were suggested by studies of long nanotubes.

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Date submitted: 27 Dec 2007 Electronic form version 1.4